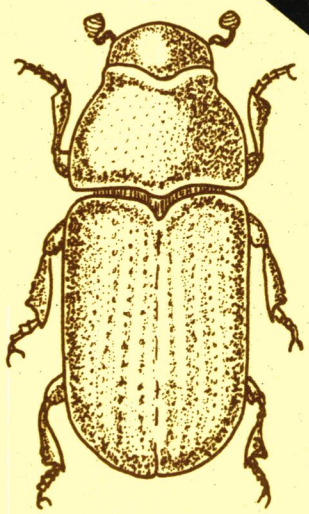
SB761
U757
76-26

R-3 76-26

THE OCCURRENCE AND CONTROL OF THE SPRUCE BEETLE IN THE SOUTHWESTERN REGION

1976



Southwestern Region

U. S. DEPARTMENT OF AGRICULTURE

FOREST SERVICE

LIBRARY

JAN 25 1977

ROCKY MOUNTAIN STATION

5200

R-3 76-26

THE OCCURRENCE AND CONTROL OF THE SPRUCE BEETLE IN THE SOUTHWESTERN REGION

By Gene D. Lessard

May 1976

Forest Insect and Disease Management
State and Private Forestry
Southwestern Region, Forest Service, USDA
517 Gold Avenue, SW
Albuquerque, New Mexico 87102

INTRODUCTION

The spruce beetle, Dendroctonus rufipennis (Kirby), has been a chronic pest of Engelmann spruce, Picea engelmannii Parry, and blue spruce, P. pungens Engelm., in Region 3 since the 1890's. Normally, spruce beetle infestations begin in sawtimber-size stands following blowdown, avalanche, or other natural disturbances. However, spruce beetle infestations have been caused by debris from logging operations.

This report summarizes the occurrence and control of the spruce beetle in the Southwestern Region. Histories are presented in alphabetical order by administrative unit.

OCCURRENCE OF OUTBREAKS

Apache-Sitgreaves National Forest - Fort Apache Indian Reservation

Large areas of spruce mortality in the headwaters of the Little Colorado River in the White Mountains of Arizona (Fort Apache Indian Reservation) were reported in a forest conditions report of the U.S. Geological Survey, 1904. Though not attributed to the spruce beetle at the time, these pockets of mortality were most likely spruce beetle-caused.

Spruce beetle populations were first recorded in the White Mountains in 1948. The infestation was located in the upper third of the Ord Creek drainage and, to a lesser extent, in the West Fork of the Little Colorado River. The infestation was not associated with any large disturbance, but may have been "triggered" by scattered storm-damaged trees. By 1951, an estimated 93,800 trees in Ord Creek drainage had been killed on 2,590 acres. Populations declined abruptly in 1952, with a few hundred trees being killed in 1953. An estimated 22 percent of the spruce was killed by the spruce beetle in the Ord Creek drainage alone from 1948 to 1953.

Further spruce beetle activity was not detected in the White Mountains until 1967. At this time, an infestation was found confined to logging debris in the Becker and Diamond Creek drainages (Fig. 1, Appendix). In 1968, the infestation spread from logging debris to standing green trees in the Becker and Reservation Creek drainages. An estimated 9,008 trees on 4,416 acres were killed in the two drainages in 1968. Tree-killing increased threefold in 1969 in Becker and Reservation Creeks and spread into Diamond, Paradise, Smith, Ord, and Bonito Creek drainages. An estimated 32,789 trees on 9,936 acres were killed in all drainages in 1969. In 1970, the infestation increased more than twofold throughout all drainages except Diamond Creek; tree-killing decreased threefold in this

drainage. In 1971, an integrated suppression program of sanitation-salvage logging and green trap trees was recommended for Becker, Diamond, Ord, Paradise, Smith, and Reservation Creek drainages. Bonito Creek was determined to be inaccessible to logging and therefore not considered in the suppression plan.

In January 1971, record-low temperatures on the Fort Apache Indian Reservation (-40° F) reduced larval populations about 90 percent in Ord, Smith, and Paradise Creek drainages. Due to this high larval mortality, suppression plans for 1971 were canceled. A subsequent decreasing population trend occurred through 1975 throughout the Mt. Baldy Primitive Area and Fort Apache Indian Reservation.

A spruce beetle infestation also was reported from 1967 to 1970 on Escudilla Mountain, Alpine Ranger District. The infestation covered approximately 400 acres of spruce-fir type. Population decline was attributed to larval mortality due to sub-zero temperatures in January 1971.

Carson National Forest

The spruce beetle was first reported in the vicinity of the Carson National Forest in 1946 and 1947 on the Rancho del Rio Grande Grant. Information on tree losses was not available for this infestation. The infestation apparently declined of natural causes.

In the early 1950's, small spruce beetle infestations recurred on the Tres Piedras Ranger District and the adjoining Tierra Amarilla Grant. By 1960, populations built up in logging debris on the Chama Land and Cattle Company and the Rivera, Stuart and Brazo Cattle Companies, Tierra Amarilla Grant. Spruce beetle-caused tree mortality was low in 1961 on the Tres Piedras Ranger District and the adjoining Tierra Amarilla Grant. But, by 1962, spruce beetles emerging from 1960-infested cull material attacked standing green trees on 8,000 acres on the Tierra Amarilla Grant and to a lesser extent over about 80 acres near the Low Lagunitas Campground, Tres Piedras Ranger District. The infestation declined in both areas in 1963. This decline was attributed to woodpecker predation, though no data were presented to confirm this diagnosis.

In 1957, a small spruce beetle infestation was detected in the Rio Chiquito drainage, Rancho del Rio Grande Grant. The infestation built up in cull logs associated with logging in the area. Approximately 250-300, 1956-attacked trees were found in two infestation centers. No 1957-attacked trees were found. The population declined of natural causes.

In 1960, a spruce beetle infestation was detected on the Taos and Penasco Ranger Districts and the adjacent Rancho del Rio Grande Grant. Spruce beetle populations built up in cull material and logging debris on the Rancho del Rio Grande Grant, which was logged annually for about 7 years prior to the infestation. Spruce beetle populations moved from logging debris to standing green spruce after logging stopped. A tenfold increase in tree-killing occurred from 1959 to 1960, and a similar increase was expected in 1961. Logging to suppress the spruce beetle was started in the spring of 1961. Suppression logging from 1961 to 1963 on 9,300 acres failed to hold the infestation in check. In the fall of 1963, a decision was made to cable-down and burn the remaining 3,000 acres of infested spruce. Spruce beetle populations decreased in 1964, probably due to the lack of suitable host material.

Cibola National Forest

The Grants Ranger District sustained spruce beetle attacks from 1963 through 1968 in the Mt. Taylor area. Blowdown throughout the Mt. Taylor area provided the impetus for extremely high spruce beetle populations in La Mosca and Water Canyons. Heavy woodpecker predation reportedly caused a reduction in spruce beetle populations in 1964. Populations declined in the area by 1968.

Coconino National Forest

The spruce beetle was first reported in the San Francisco Peaks, Coconino National Forest, in 1953. This infestation declined of natural causes by 1954.

In 1962, a spruce beetle infestation was detected in the Arizona Snow Bowl Recreation Area on the west side of San Francisco Peaks. The infestation was localized in down spruce created by the construction of new ski trails. Spruce beetle attacks on standing spruce were not reported in subsequent years. The infestation declined of natural causes by 1963.

In 1967, a spruce beetle infestation was detected in down spruce on the west side of Agassiz Peak, San Francisco Peaks. Downed spruce was the result of a heavy snow and ice storm, followed by high winds in December 1966. A subsequent blowdown occurred during the winter of 1967-68 providing additional spruce beetle brood material. In August 1968, infested spruce was treated with ethylene dibromide. Control was successful (see "Control" section).

In 1973, a spruce beetle infestation was detected on 15 acres of avalanche-damaged spruce in Dunham Canyon, Inner Basin, on the east side of the San Francisco Peaks. An upward trend in spruce beetle populations occurred in 1974 in damaged spruce, with new attacks prevalent in standing green trees. In an effort to suppress the infestation, infested trees were bucked and peeled, and infested stumps were peeled and burned. Because suppression measures were only partially carried out, no control was achieved. A second attempt at suppression, consisting of sanitation-salvage logging, was started in 1975. All 1974- and 1975-infested trees were removed from the area and the stumps were peeled and burned. This second effort successfully suppressed the outbreak.

An additional infestation in the San Francisco Peaks, Arizona Snow Bowl, was detected in 1974. The infestation was localized in downed spruce and residual stumps, created by high winds in the winter of 1974. A portion of the infested material was removed from the area in the fall of 1975. Removal of the remaining infested material was planned for 1976.

Coronado National Forest

In the early 1950's, an isolated spruce beetle outbreak was reported on Mt. Graham, Safford Ranger District. This infestation was located on the eastern portion of the timbered area on Mt. Graham. The infestation declined of natural causes.

In 1968, a small spruce beetle infestation in windblown spruce was detected near Webb Peak Lookout. This infestation was limited to 20 downed spruce on about 2 acres. All spruce beetle activity declined in this area in 1969. Logging of infested trees (large-diameter trees in many susceptible stands) and burning of residual logging slash reportedly attributed to the decline.

Kaibab National Forest and Grand Canyon National Park

In 1967, spruce beetle activity was reported in logging debris and slash on the Marble sale unit, North Kaibab Ranger District, Kaibab National Forest. The timber sale area covered 4,000 acres. An additional spruce beetle infestation in 1967 was discovered in 2,000 acres of scattered spruce blowdown on the North Rim, Grand Canyon National Park. Subsequent spruce beetle activity in standing spruce was not reported in either of these areas.

An extensive blowdown in mixed conifer occurred in October 1972 on the North Rim of the Grand Canyon. A potential outbreak was prevented by a sanitation-salvage logging program.

Lincoln National Forest

In the early 1890's, spruce beetle-caused tree mortality occurred near Sierra Blanca on about 13,142 acres. The area was not evaluated until 1907. At this time, investigators estimated that about 10-15 percent of the area was destroyed by a fire sometime between 1892 and 1895, and about 90-95 percent of the remaining area was destroyed by the spruce beetle. The investigators determined that the spruce beetle infestation predated the fire, but were unable to say by how many years. This infestation declined of natural causes in the mid-1890's.

In 1925 and 1926, spruce beetle activity was noted on the Sacramento Ranger District. Infestations were localized in Wills and Hubbell Canyons. The spruce beetle spread to the north into Water Canyon in 1927 and to the east into Hay Canyon in 1928. Infestations in Wills and Hubbell Canyons declined in 1927 and in Water Canyon in 1928. The remaining infestation in Hay Canyon declined in 1930.

In the spring of 1969, the spruce beetle was found in downed spruce in the vicinity of the Sierra Blanca ski area. Downed material was created during road and ski-run construction, as well as windthrow. Infested material was treated with ethylene dibromide in 1969. Control was successful (see "Control" section).

Santa Fe National Forest

In the mid-1930's, scattered groups of trees were found infested with spruce beetle on the Pecos and Las Vegas Ranger Districts, Santa Fe National Forest. By 1936, populations increased throughout the spruce-fir type in Gallinas Canyon. Control was implemented in November of 1936 by an ERA (Emergency Relief Authority) crew and completed by February 1937 (details on the type of control implemented are not known). No new attacks were found in 1937, suggesting that control was successful. However, an evaluation was conducted in October 1938 in an infestation in Holy Ghost Creek, to the west of Gallinas Canyon. Old attacks found at that time suggested that a spruce beetle infestation existed in the late 1930's; no new attacks were found during the evaluation. It was possible that natural factors caused the decline of the Gallinas Canyon infestation, irrespective of ERA control efforts, as was apparently the case for the Holy Ghost Creek infestation.

A spruce beetle infestation persisted for 2 years in Alamitos Canyon, Pecos Ranger District, from 1946 to 1947. This infestation declined of natural causes.

In 1960, a small infestation was detected in the Rio Mora drainage, Pecos Wilderness. This infestation declined of natural causes by 1961.

In 1962, a 500-acre infestation on the Las Vegas and Pecos Ranger Districts developed in association with wind-broken spruce tops. This infestation was located near Elk Mountain in the headwaters of Gallinas Creek. Old 1960-attacked trees were found concentrated on the north, west, and southwest side of Elk Mountain. The decline of the infestation by 1963 was attributed to heavy woodpecker predation.

Also in 1962, spruce beetles were found on the Tesuque Ranger District, concentrated in approximately 50 downed spruce associated with the construction of the Tesuque Peak service road and in windthrow trees. Infested material was treated with ethylene dibromide in 1962, and control was successful.

Additional beetle activity on the Santa Fe National Forest was not reported until 1967. At this time, spruce beetle activity was found in association with 10 acres of windblown spruce near Lake Johnson, Pecos Wilderness. The windthrow occurred in March 1966. Beetles from this outbreak did not infest standing trees in succeeding years. Woodpecker predation and the dry condition of infested logs reportedly attributed to the decline of the infestation in 1968.

In September 1968, an intense infestation was detected on the Cerro Valdez and Mesa del Medio Units of the Coyote Ranger District, and the Mesa del Medio Unit of the Espanola Ranger District, adjacent to Baca Location 1. The source of the infestation was thought to be from scattered blowdown along the boundary of clearcuts on the Baca Location 1. There were 2,720, 1967-attacked trees, and 7,836, 1968-attacked trees over 462 acres. This infestation was concentrated in over 4,000 standing spruce in the Canones and Chihuahuenos drainages. In the fall of 1969, the infestation spread to the west of the Canones drainage into the Coyote Creek drainage and to the north and east into the Polvadera Unit along Chihuahuenos Creek. The Mesa del Medio Unit contained a high concentration of 1969-attacked trees, but little new blowdown. On the other hand, the Polvadera Unit contained a relatively low concentration of 1969-attacked trees, but the incidence of blowdown was high. As expected, the infestation moved farther east into the south and west forks of Polvadera Creek in the vicinity of Cienega Redonda in 1970, and even farther east in 1971 in an area surrounding the Cienega del Oso. A control program, consisting of logging infested spruce and utilizing green trap trees, was conducted from 1969 to 1971 on the Mesa del Medio and Polvadera Units. Spruce beetle populations declined in this area by 1972. Subnormal temperatures in January 1971 caused heavy larval mortality and reportedly attributed to the decline of this infestation.

From 1968 to 1970, a spruce beetle infestation was detected in standing spruce in the Rito Cafe drainage, Cuba Ranger District. This infestation was, in part, located in the San Pedro Parks Wilderness Area. Populations in this area declined by 1972 due to subnormal winter temperatures.

High winds, in excess of 70 mph in October 1971, produced extensive spruce blowdown throughout the Jemez Mountains. This material, infested in 1972, provided brood material for the initial buildup of populations which flew and attacked standing green trees in 1974. The infestation covered approximately 75,000 acres throughout the spruce-fir type. The infestation also was located within the San Pedro Parks Wilderness Area. The greatest tree and basal area losses were found in the South Fork Polvadera Creek drainage, Espanola Ranger District; the Rito Cafe Creek drainage, Cuba Ranger District; and in the vicinity of Cerro del Grant, Coyote Ranger District, respectively. Tree and basal area losses were lowest in the vicinity of Cerro Pavo, Coyote Ranger District. Initial plans for sanitation-salvage logging in 1976 were formulated in the fall of 1975 and started in January of 1976.

CONTROL

Carson National Forest

In April 1961, logging to suppress a spruce beetle infestation was initiated on the Taos and Penasco Ranger Districts, Carson National Forest. The area was divided into 16 sale units: Osha I, II, and III; Luna I and II; Sardinas I, II, and III; La Presa I, II, III, IV, and V; Jarocito, Lujan, and Boundary (Fig. 3). The Rio Chiquito Unit in Figure 3 was not included in the suppression plan. The timber to be sold consisted of 51.5 MMBF of Engelmann and blue spruce and 8.5 MMBF of white fir, alpine fir, and Douglas-fir.

The objectives of the sale were:

1. The removal of all live spruce 10" or greater in diameter, with utilization to an 8" top.

2. The destruction of all cull material, by burning, in excess of 4" in diameter.

3. Felling of "trap trees" to be removed the following year.

4. Felling of marked snags, not to exceed 10 such trees per acre on any 5 acres.

5. The prompt removal and sawing of infested material, as well as the destruction, by burning, of all slabs.

Initially, there were plans to sell all 16 units by April 1961. Because of contractual difficulties, only the Sardinas II and III, Jarocito, and Boundary Units were sold at that time. The remaining

units, excepting the Luna I Unit, were sold by September 1961. The Luna I Unit was not sold until 1963. The actual total volume of timber sold by 1963 was 71.51 MMBF.

Suppression logging on the Sardinas II and III, Jarocito, and Boundary Units began in the spring of 1961 and on the remaining units, excepting the Luna I, in the spring of 1962. Logging on all units was scheduled for completion by July 1963. Due to delays, only 4 of the 16 units were completed in the scheduled time. By the end of the 1963 season, an estimated 39.3 MMBF of all species were harvested over 9,300 acres--55 percent of the total volume. A portion of the unharvested infested volume was culled due to checking.

Because efforts to suppress the infestation were falling behind schedule, and the cost of machine piling of slash was excessive, the decision was made to cable the remaining infested material and broadcast burn. Machine-cabled stands were high-graded prior to cabling. Machine-cabling was well underway by August 1963. During cabling operations, some desirable reserve stands were taken down. Those reserve stands not destroyed by cabling were invariably damaged by the ensuing broadcast burning. By the end of the 1964 season, nearly 3,000 acres were machine-cabled and burned. Some additional salvage logging was conducted in the Luna I and La Presa Units through 1966.

Coconino National Forest

In 1968, the infestation on Agassiz Peak was treated with ethylene dibromide. Approximately 800 downed trees over about 40 acres were bucked and saturated with a formulation of 1.0 lb of ethylene dibromide in 5.0 gal of fuel oil. A post-control evaluation showed larval mortality was high. Control was considered successful.

Efforts to control the spruce beetle in the Inner Basin, San Francisco Peaks, were initiated in 1974. Infested material was bucked and peeled, and stumps were peeled and burned. A post-suppression evaluation, conducted in June 1975, indicated that the suppression effort was unsuccessful. The primary reasons for failure were: (1) only 90 percent of the infested material was bucked, (2) only 50 percent of the bucked material was peeled, (3) about 50 percent of the peeled logs were only partially peeled, and (4) only half of the infested stumps were treated. A second effort at suppression was conducted in 1975. Suppression consisted of salvage logging of 1974- and 1975-infested trees and peeling and burning of infested stumps. A post-suppression evaluation, conducted in October 1975, indicated that suppression was successful.

Lincoln National Forest

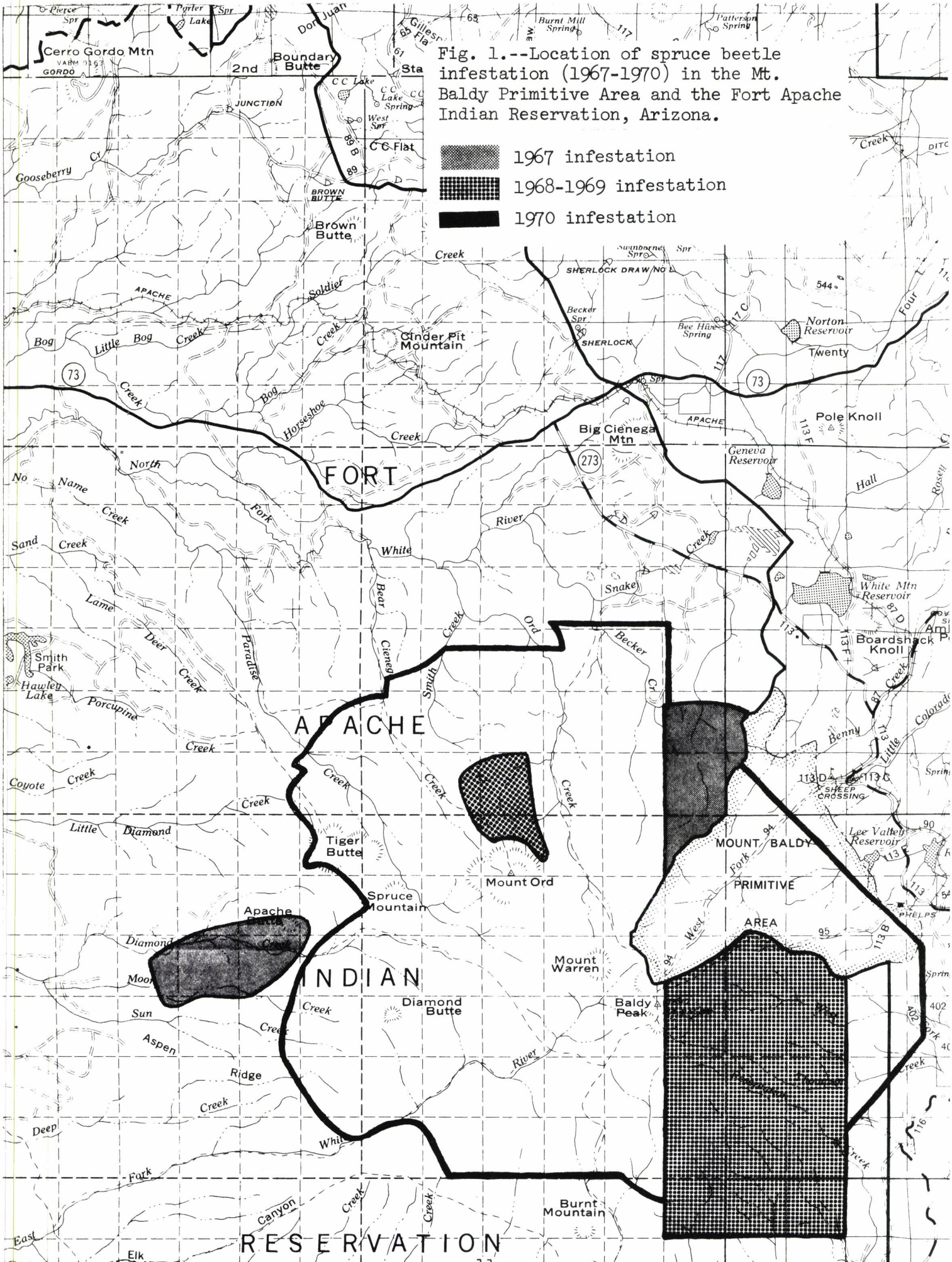
The spruce beetle infestation in the Sierra Blanca ski area was treated with ethylene dibromide in 1969. Approximately 75 trees were treated with a formulation of 1.0 lb of ethylene dibromide in 5 gal of #2 fuel oil. A post-suppression evaluation, conducted in July 1970, indicated that spruce beetle populations were extremely low. Control was considered successful.

Santa Fe National Forest

The spruce beetle infestation along the Tesuque Peak service road, Tesuque Ranger District, was treated with ethylene dibromide in 1962. Approximately 50 trees were treated with 1.0 lb of ethylene dibromide in 5 gal of fuel oil. Control was considered successful.

A control program was initiated against the spruce beetle infestation on the Mesa del Medio, Espanola Ranger District, in 1970. Control consisted of logging infested material in 30-acre clearcut patches, felling and removing of trap trees in 1970 and 1971, and burning of infested slash and cull material resulting from the timber sale. By 1971, 7.5 MMBF of infested trees were logged on 8,500 acres. Slash disposal and trap-tree removal were completed by December 30, 1971. The cultural cutting and trap-tree programs, coupled with adverse winter temperatures and light snowfall, reportedly reduced beetle populations to low levels by 1971.

A P P E N D I X


Cerro Gordo Mtn
Boundary Butte
2nd
CC Flat
Brown Butte
Cinder Pit Mountain
Big Cienega Mtn
Norton Reservoir
Pole Knoll
Geneva Reservoir
White Mtn Reservoir
Boardshack Knoll
Lee Valley Reservoir
Smith Park
Hawley Lake
Tiger Butte
Mount Ord
Spruce Mountain
Mount Warren
Diamond Butte
Baldy Peak
Burnt Mountain
Sheep Crossing
Phelps
FORT
APACHE
INDIAN
RESERVATION
MOUNT BALDY
PRIMITIVE
AREA
Fig. 1.--Location of spruce beetle infestation (1967-1970) in the Mt. Baldy Primitive Area and the Fort Apache Indian Reservation, Arizona.
1967 infestation
1968-1969 infestation
1970 infestation

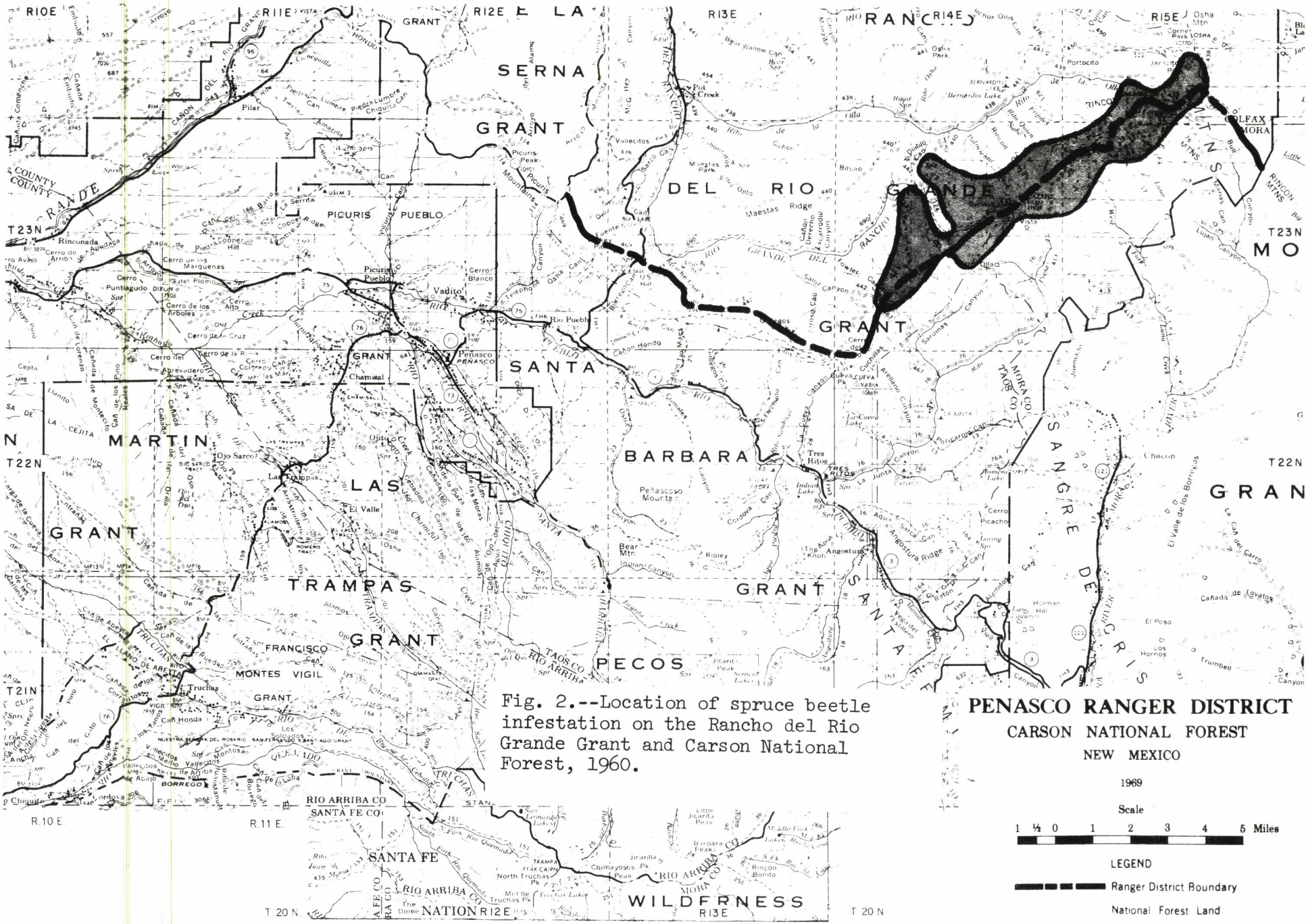


Fig. 2.--Location of spruce beetle infestation on the Rancho del Rio Grande Grant and Carson National Forest, 1960.

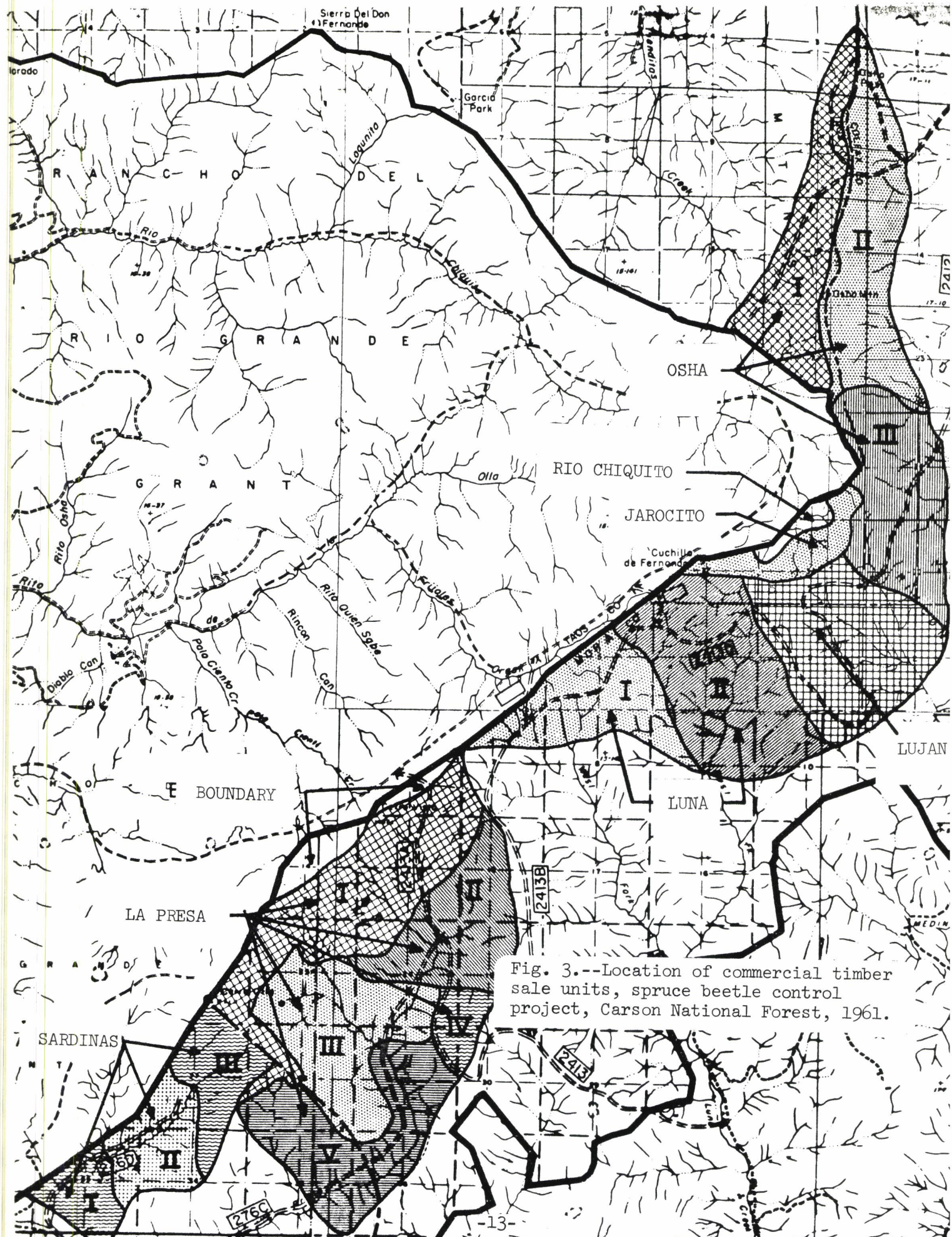


Fig. 3.--Location of commercial timber sale units, spruce beetle control project, Carson National Forest, 1961.